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TITLE: FLANGE MEMBER FOR JOINING PLATE AND
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ABSTRACT:

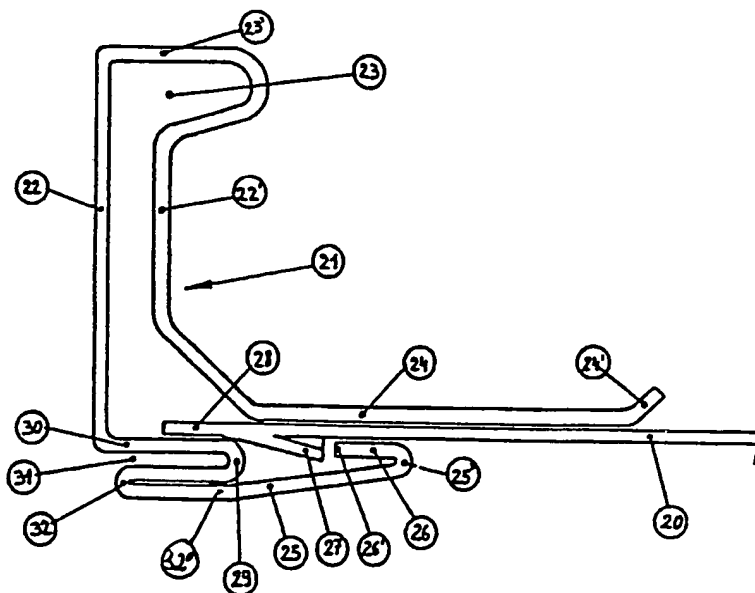
An improved joint flange for connecting air duct sections by means of a "snapp in" type operated connection comprises a first hollow vertical leg and integral therewith a horizontal leg terminating in an open-ended slot or jaw for frictionally engaging a duct end portion (20). The base wall of the first leg cooperates in the duct end connection. The lower side

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material-saving, cost-effective and flexible joint member
is achieved by an
inventive L-profile of less complication.



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<p>(21) International Application Number: PCT/BE89/00018</p> <p>(22) International Filing Date: 26 April 1989 (26.04.89)</p> <p>(30) Priority data: 8800483 27 April 1988 (27.04.88) BE</p> <p>(71) Applicant (for all designated States except US): AIRKAN N.V. [BE/BE]; Kortrijkstraat 305, B-9700 Oudenaarde (BE).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only) : TSJOEN, Luc [BE/BE]; Moregemplein 17, B-9790 Wortegem-Petegem (BE).</p> <p>(74) Common Representative: TSJOEN, Luc; Moregemplein 17, B-9790 Wortegem-Petegem (BE).</p> <p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent),</p>		<p>US.</p> <p>Published <i>With international search report.</i></p>
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**(57) Abstract**

An improved joint flange for connecting air duct sections by means of a "snapp in" type operated connection comprises a first hollow vertical leg and integral therewith a horizontal leg terminating in an open-ended slot for jaw for frictionally engaging a duct end portion (20). The base wall of the first leg cooperates in the duct end connection. The lower side of the L-profile is provided with an integrated means (31) for the fixation or support of an air channel insulation, said means being formed by a sheet material ply located below the duct end engaging base wall (30) of said first leg. A material-saving, cost-effective and flexible joint member is achieved by an inventive L-profile of less complication.

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1.

Flange member for joining plate and ducts elements.

The present invention relates to a joint member for connection to a planar plate element. More in particular, this invention concerns a flange member in the form of a L-shaped profile made of thin walled sheet material for connection to the adjacent end portions of duct sections to be joined therewith.

The ducts here considered are generally prismatic, more often rectangular channels having flat angularly adjoining sidewalls. They are generally used for air-conditioning, heating and/or ventilation purposes. Although conveyance of air is the most usual application for said ducts, it is understood that other gaseous media may also be considered. Air ducts are normally fabricated from thin galvanized sheet steel in the form of rectangular duct sections of predetermined length. Said duct sections are assembled into channels of any desired length by connecting the ends of adjacent duct sections to one another by means of flange members or profiles having a L-shaped cross section. In practice, flange members of elongate L-section profile are positioned on the end portions of adjoining sidewalls at both ends of adjacent duct sections by frictional engagement of a leg portion of said flanges with said sidewalls received therein. The flanges positioned around the circumference of adjacent duct ends constitute a polygonal, in particular a rectangular joint frame whereby adjacent flange members are affixed by interlinking corner pieces having associated angularly or curvilinearly profiled arms extending into open-ended transverse channels of neighbouring L-profiled flanges. In this way a rectangular duct end will be fitted to a joint frame composed of 4 elongate L-shaped flange members. By putting said joint frames back to back, and affixing the generally parallel and planar front walls of their associated flange profiles, a rigid and leak-proof connection between adjacent duct sections can be realised, for instance by

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positioning a sealant or gasket between the contacting flange sides of a pair of joint frames prior to bolting or screwing them to one another.

The sheet material used for flanges and duct sections in air duct applications is usually galvanized steel strip, but other materials such as stainless steel and non ferrous metals or alloys (e.g. copper, aluminium, zinc and their alloys) are envisageable too when the medium to be transported is too corrosive or detrimental in other respects to common galvanized sheet. As a matter of fact sheet materials comprising special protective coatings and even all plastic material are possible.

Aforementioned joint frames and flange members of L-shaped cross-section are known, for example, from German Patent Documents DE-A-2138966, DE-A-2836761 and DE-A-1650169, and further from British published application GB-A-2132724 and U.S. Patent Specification US-A-3199901.

The difficulty with such prior art flange members is that their design is directed to a specific purpose which gives rise to certain drawbacks with respect to other aspects and requirements of modern duct assembling and joining technology. The duct connections realised with joint frames and profiles described in US-A-3199901 necessitate the use of reinforcing guide rails to ensure sufficiently tight joint. Similarly, DE-A-1690169 discloses a simplified single-wall L-profile which is cheap in fabrication. However, a number of additional sealing and strengthening measures are required, after connection of the L-shaped profiles to the duct ends, in order to obtain a satisfactory joint.

On the other hand DE-A-2836761 proposes a joint frame of great inherent strength and stability by the provision of an extremely rigid L-profile construction having a double-wall construction wherein the slot-forming leg contains two bent-over double-ply stiffening ribs. In this case the greatly improved structural stability is only achievable by a flange

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design requiring considerably more sheet material and increased fabrication costs due to the complicated shape of the second leg.

The coupling flange disclosed in GB-A-2132724 is particularly directed to the provision of an improved "snap-in" type joint which should prevent

5. relative shifting of a connected duct side-wall in the flange jaw. Here the upstanding leg surrounds a large channel volume and the upper wall end portion of the horizontal leg is folded in an abutting relationship up to against the interior channel wall and is then bent over again rearwards along the lower rib of said leg. Such a construction is some-

10. what less demanding than the configuration known from DE-A-2836761, but is still not cost-effective nor material saving.

In addition to above-mentioned drawbacks, a general important disadvantage of conventional flange members concerns the fact that none of them comprises an integrated means which enables the disposition of a heat
15. insulating and/or noise damping material within the interior duct channel without the use of separate affixing and supporting means. This means that the latest requirements of heat and noise insulation, which are increasingly requested in air duct installations, can only be fulfilled with prior art flange connection systems at the cost of extra labour
20. and fixation means.

It is therefore an object of the present invention to provide a flange member for connection to planar sheet elements, in particular duct sections to be connected together, which overcomes the insufficiencies of hitherto known L-shaped profiles used in joint frames related to flange
25. fabrication cost, sheet material consumption and fluid-tight connections of sufficient stability. Another important object of this invention is to provide a low-cost flange member of improved design which allows easy and rapid connection of adjoining duct sections in a leak-proof manner without the use of welding, soldering and the like joining tech -

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nics, thereby achieving a detachable mechanical connection of large enough structural strength. A most important general object of the present invention is to provide a novel flange member concept of L-shaped cross-section comprising a means, substantially integral with the flange configuration, for affixing and/or supporting an insulation layer adapted to form an interior jacket of a channel made of joined duct sections. These and other objects are achieved by an improved flange member in the form of an elongate profile of L-shaped cross-section having an inventive design as defined in main claim 1.

10. Further and preferred embodiments of a flange member in accordance with this invention are defined in the appending subclaims.

The present invention will be best understood from the following detailed description when read in conjunction with the following accompanying drawings.

15. Figure 1 shows several examples of commercially available profiles of L-section illustrating the state of the art.

Figures 2 a and 2 b are views in cross-section of flange members in accordance with the present invention.

Figures 3a - b illustrate the disposition of a sealing means in a flange profile of this invention.

Referring now to fig. 1a there is shown a common L-type joint profile of double wall construction fabricated from light-gauge sheet material. It basically comprises an upstanding leg disposed generally perpendicular to duct side wall 1 frictionally received within an open-ended slot formed by terminating end portions of overlying upper and lower walls 6, 5 constituting the second horizontal leg of the flange member. The upstanding leg encloses an elongate chamber 3 which is closed at its upper side but open-ended at both lateral sides of the profile.

Fig. 1b shows a similar L-profile flange member wherein the end portion

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of lower wall 5 is bent into a pocket-forming despression to receive a sealant material 7, which is intended to seal the duct channel interior (below duct end 1) from chamber 3. The example shown in fig. 1 c proposes an interior leak-proof joint by means of a ply 8 in front wall 4, 5. which ply is downward sloping to contact wall 5 of the horizontal leg and thereby increases the clamping effect of walls 5, 6 where between duct end 1 is frictionally engaged up to below ply 8. The pocket formed between ply 8 and wall 5 may be filled with a sealant 9. In fig. 1 d- e there are shown dimples or protuberances 10, 10' intended to stiffen the 10. walls of the profile. A general drawback of the L-shaped flanges illustrated in fig. 1 a to e is the need for extra fastening measures in order to reinforce the profile-to-duct connection and to prevent relative movement of the frictionally engaged side wall 1 . Moreover, the illustrated joints suffer from poor fluid-tightness and do not allow simple 15. and easy fixation of an interior channel insulation.

Preferred embodiments of a flange member in accordance with the present invention are depicted in figs. 2 a and 2 b . Accordingly there is the provision of an elongate profile 21 of L-section comprising a first upstanding hollow leg arranged generally perpendicular to the plane of 20. a sidewall 20 of a duct section to be connected thereto, and a second leg integral with said first leg defining a slot between end walls thereof adapted to frictionally engage and restrain a duct end portion wall 20 received into said slot. The first leg defines an elongate chamber 23 enclosed by vertical front wall 22 and rear wall 22', respectively up- 25. per closing wall 23' and lower base wall portion 30. Chamber 23 is open-ended at two lateral terminating faces. A major mid portion of rear wall 22' usually parallels front wall 22, whereby the lower side of rear wall 22' slopes down and away from its vertical position to be continued at its lowest point in the upper wall 24 of the slot-forming

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second leg paralleling duct sidewall 20. Said upper wall 24 terminates in a upwardly inclined flap 24' for facilitating entry of duct sidewall 20. The novel flange member is characterized by the following inventive features :

- 5.- the jaw or clamping parts of the slot defined in the second leg are formed by wall 24 contacting the upper side of received duct sidewall 20 by free end 26 of lower wall 25 and by chamber base wall 30 which is positioned slightly below (maximum distance being ^{preferably} not more than thickness of wall 20) wall 24 .
 - 10.- base chamber wall 30 is continued in lower side wall 25 of the second leg by the intermediate of an inwardly folded sheet ply 31 disposed parallel to duct end portion 20, said ply defining an elongate front slot which has the function of fixation and/or supporting means for an insulating material to be attached to the inner side of duct channel section joined by flange members 21. The depth of slot 31 defined between point 29 , where chamber base wall 30 is rebent in the direction of front wall 22, and point 32 where sheet is again rebent rearwards, but this time closely fold against the bottom side of slot 31, is advantageously smaller than the width of base wall 30. In any case
 20. refolding point 32 is located at least somewhat behind front wall 22 to allow accomodation of any insulation fixation means.
 - bottom wall 25 is inclined upwardly and terminated in a folded-over flap portion 26 paralleling upper wall 24 and defining therebetween a slot entry when duct end 20 is inserted. Moreover the free end 26' of
 25. flap 26 forms a stop means for corresponding protuberances or dimples 27 formed in duct wall 20, so that after connection of flange member 21 to duct end portion 20 , retraction of wall 20 is restrained.
- Furthermore bottom wall 25 only partially overlies overshooting upper wall 24. In this way not only a further saving of sheet material is

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achieved, but in addition a larger clamping effect is obtained from the comparatively steeper upward inclination of bottom wall 25 depending on the position of rebending point 25' relative to the free end 24'.

5. As a result of said combined measures, a cost-effective joint flange is realised which ensures a tight and leak-proof mechanical connection of sufficient strength and which at the same time allows to attach very efficiently and easily a desirable insulating jacket to the inner of the connected duct sections. This is achieved without use of additional fastening means for the flange connection and insulation support attachments, that are normally required in conventional flange joints.

This advantage saves a considerable amount in labour and material costs. Fig. 2b illustrates a flange embodiment according to the invention which is of a heavier construction compared with fig. 2a. Here the sheet steel 15. from which the L-profile is formed by rolling, bending, plying, roll-forming has a larger wall-thickness and the upstanding leg being of a greater height comprises at the rear side reinforcing ribs of the kind depicted by reference sign 35 in wall 22'. In fact structural strength may be varied and adapted according to circumstances by suitable selection 20. of wall thickness, shoulder form (transition between upper side of front wall 22 and rear wall 22'), and the provision of reinforcing ribs (folds, thimples, protuberances, and the like) in the vertical walls of the upstanding leg, preferably in the rear wall 22'.

The frictional clamping and sealing effect of the slot-forming horizontal 25. leg may be enhanced by narrowing the distance in the vertical direction between wall 24 and base wall 30 to a value smaller than the wall thickness of duct end portion 20.

The same applies to the position of flap 26 relative to free end 24' and to the lower side of wall 24. Also here the jaw effect can be increased

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by providing a larger springback force or resistance (active upon insertion of duct end 30 between wall 24 and flap 26). This is advantageously achievable by taking the length of lower wall 25 markedly smaller than the length of upper wall 24.

5. Of course the "snap-in" or "clips" connection formed between the laterally spaced protuberances 27 disposed at the inserted end of duct wall 20 and the anchoring action of flap 26 cooperating therewith prevents retraction of the connected duct end. The free end portion 28 of duct wall 20 which frictionally contacts base wall 30 may engage the front wall 22
10. (abutment may also be provided in the form of a sheet ply in the bottom portion of front wall 22, similar to fig. 1c.) Thus a tight and rigid connection is achieved between a duct section and a flange member of this invention, resp. a joint frame, by a simple snapping insertion operation, and this without the need of welding, bolting, screwing or riveting the
15. flange to the duct end portion to prevent movement of the duct in the joint frame after completion of the flange connections.

In fig. 3a and 3b there are shown two embodiments of this invention comprising additional sealing means to prevent leakage from the duct channel interior to the flange chamber 23.

20. In fig. 3a a resilient sealing mass or paste is disposed in the space of the horizontal leg located between the rear side 29 of slot 30 and the end portion 26' of restraining flap 26.

In fig. 3b the end portion of flap 26 is provided with a pocket forming depression 34 wherein a sealant 33 is disposed.

25. When using steel sheet of heat-ageable or precipitation hardening composition, the finished L-profile may advantageously be heat-treated to relieve forming stress, stabilize the plies and profile geometry, and to enhance the strength and clamping force (springiness) of the jaw walls, in particular upper wall 24 and lower wall 25.

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CLAIMS

1. A flange member for connection to flat plate elements, in particular for connection to the planar end portions of prismatic or rectangular duct sections to be joined together, which duct sections have flat
5. angularly adjoining sidewalls to be connected to a plurality of flange members forming thereupon a polygonal or rectangular joint frame at paired adjacent duct ends, each of said flange members being constituted by an elongate profile having a generally constant L-shaped cross-section, said L-profile being integrally formed by a thin-walled
10. sheet of material, including a first upstanding hollow leg enclosing an elongate transverse open-ended chamber 23 bounded by a front wall 22, an upper wall 23', a rear wall 22' and a base wall 30, and a second substantially horizontal leg integral with said first leg and paralleling a duct wall 20 to be connected thereby, said second
15. leg having a lower wall 25 and an upper wall 24 terminating in two free ends thereby forming a rearwardly open slot for receiving therein and therebetween a duct end portion 20, characterized in that the base wall 30 of said chamber 23 forms a third frictionally engaging face for said duct end 20 which is then clamped ^{between} upper slot wall
20. 24, lower slot wall 25 and chamber base wall 30, and in that there is the provision of an elongate front slot 31, open-ended at the front wall side and closed at the rear side 29, which slot is disposed below base wall 30 and formed by a full rearwardly directed sheet material ply (29,30,32) thereby forming an integrated fixation end/or
25. support means for the attachment of an insulating /damping material layer or jacket to the interior of the air channel defined in said connected duct sections, and further in that the lower wall 25 has a first rebent portion 32-32' closely overlying the bottom portion of slot 31, a second portion 32'-25' upwardly inclined towards upper

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wall 24, whereby end point 25' is spaced away from free end 24' in the direction of the front wall 22, and a third refolded end portion or flap 26 paralleling upper wall 24 and forming a restraining means adapted to operate as a "snap-in" type connection with a cooperating means

5. 27 of duct end 20.

2.A flange member as set forth in claim 1, wherein the entry side 32 of slot 31 is spaced away in the rearward direction relative to the front wall 22, and wherein base wall 30 horizontally extends to a point 29 which lies between the horizontal onset of upper wall 24 and one third the distance between front wall 22 and upper wall 24.

3.A flange member as defined in claim 1 or 2, wherein the refolding point 25' of lower wall 25 is spaced away from free end 24' of upper wall 24 over a distance which is at least one third of the total length of upper wall 24.

15.4.A flange member as defined in any one of claims 1 to 3, wherein rear wall 22' has a major portion parallel to vertical front wall 22, and wherein a rearwardly directed shoulder is provided in the upper transmission portion of the first leg between front wall 22 and rear wall 22', the latter wall 22' being optionally provided with reinforcing ribs.

5.A flange member as defined in any one of claims 1 to 4, wherein the duct engaging slot of the profile is provided with a sealant means to prevent leakage from the inner duct channel to the profile chamber 23.

6.A flange member as defined in claim 5 wherein said sealing means is a sealant mass applied in inner space of the horizontal leg formed between flap end 26, upper wall 24 and back side of front slot 31.

7.A flange member as defined in claim 5, wherein said sealing means is in the form of a pocket 34 arranged in an end portion of flap 26, said pocket being adapted to contain a sealing material.

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8. A flange member, as defined in any of claims 1-7, wherein said sheet material is a coated steel sheet, in particular galvanized steel and aluminized or Zn-Al alloy coated steel.

9. A flange member as defined in any of preceding claims 1-7 wherein

5. said sheet material is a member of the group of stainless steel alloys, copper and its alloys, aluminium and its alloys, zinc and its alloys, nickel and its alloys, and structural plastics.

10. A flange member as defined in claim 8 wherein said steel material after forming into an L-profile is heat-aged or stabilized by a

10. heat treatment which improves the profile strength and ^{clamping} springiness of the duct receiving slot walls.

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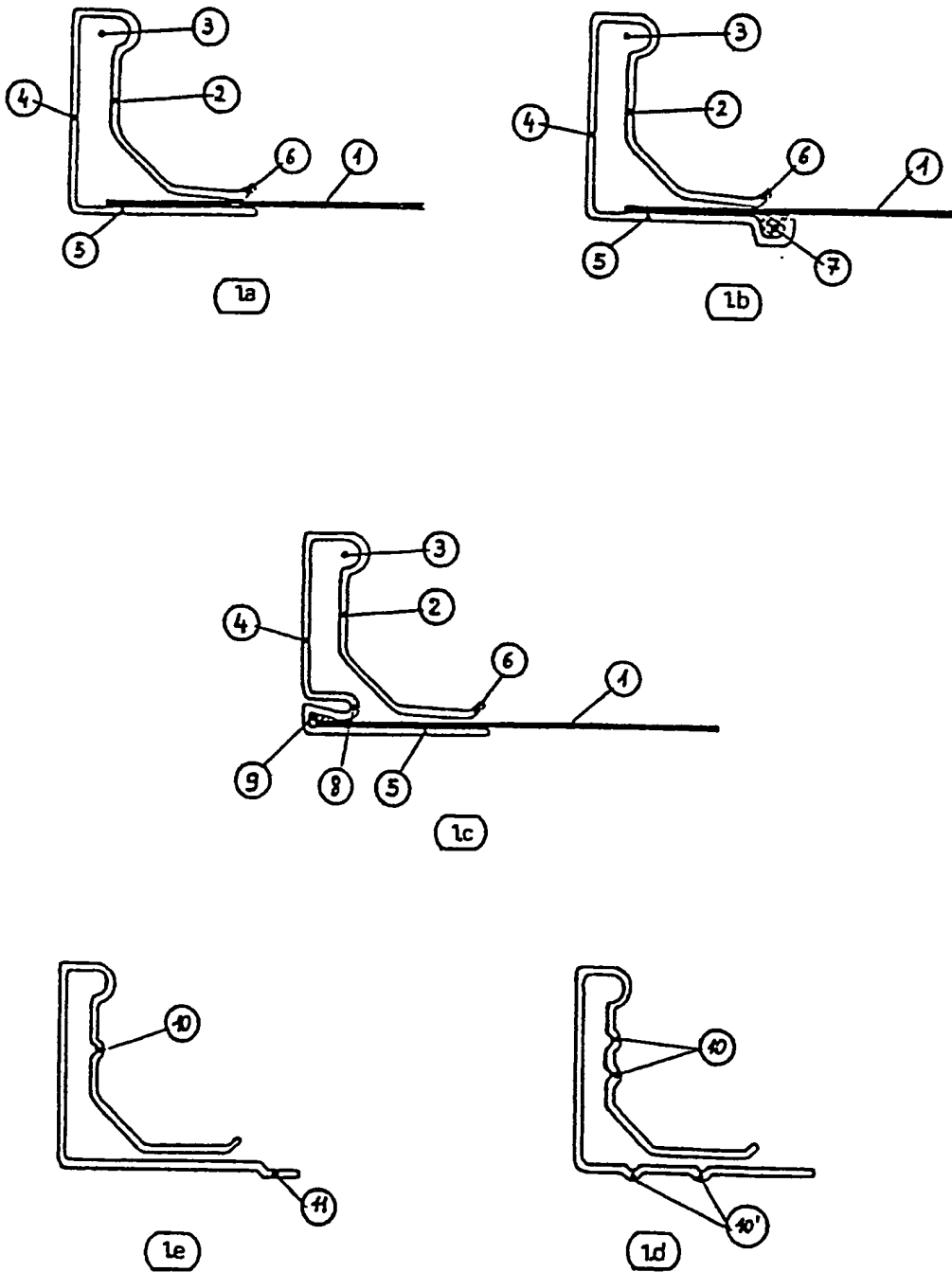
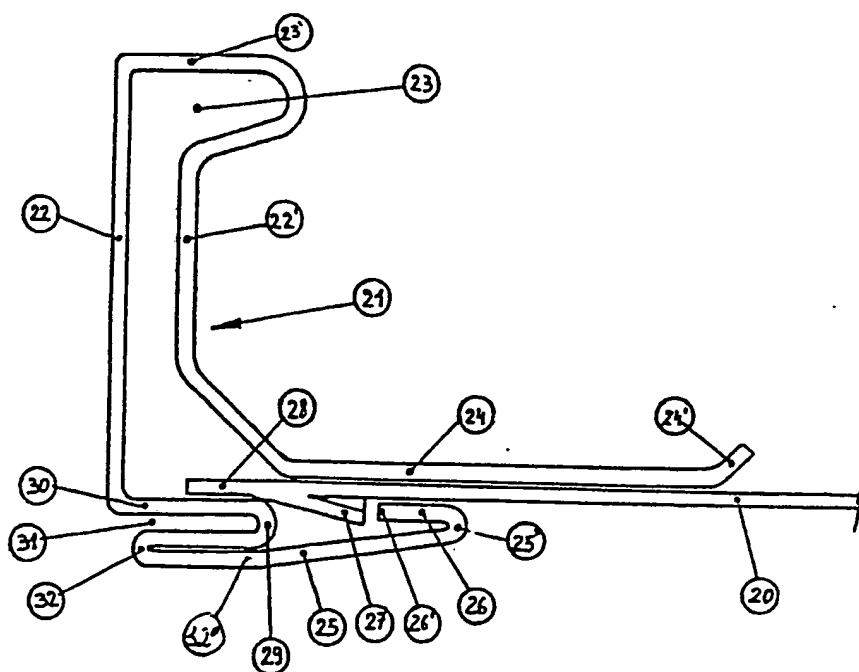


Fig.1

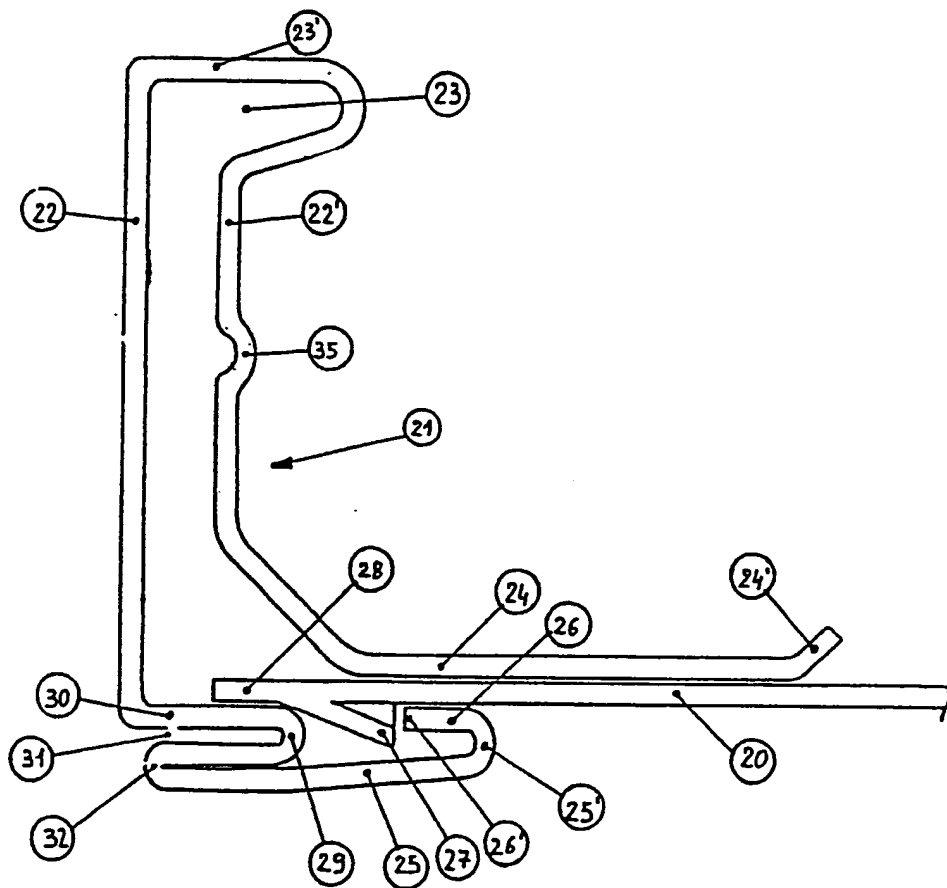
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Fig. 2a

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Fig.2b

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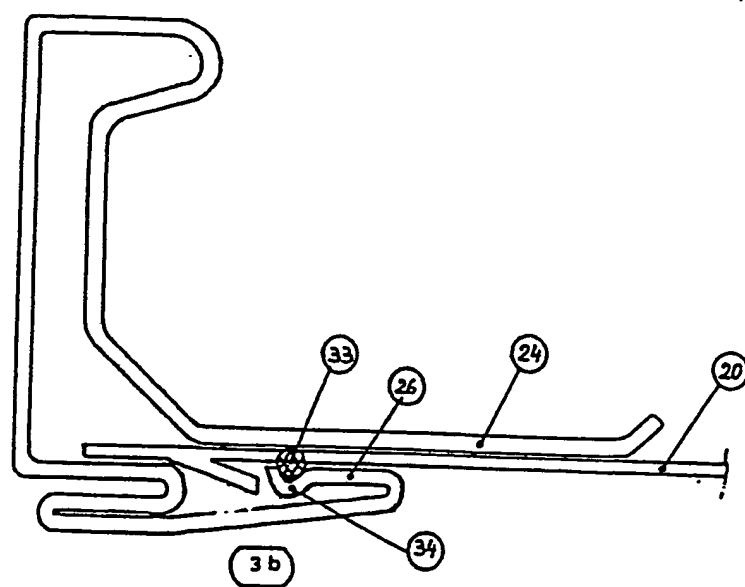
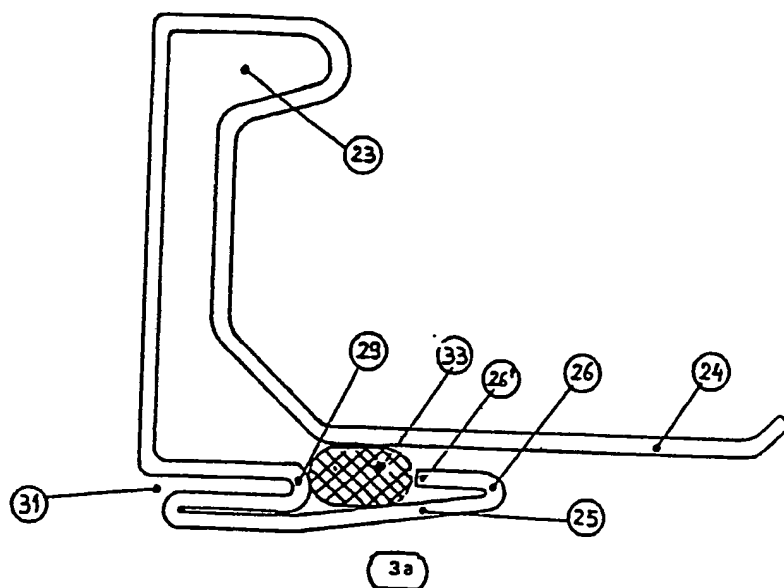


Fig. 3

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INTERNATIONAL SEARCH REPORT

International Application No PCT/BE 89/00018

I. CLASSIFICATION F SUBJECT MATTER (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁴ : F 16 L 23/00																	
II. FIELDS SEARCHED <div style="text-align: center; margin-top: 10px;">Minimum Documentation Searched ⁷</div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 30%;">Classification System</th> <th style="width: 70%;">Classification Symbols</th> </tr> <tr> <td style="text-align: center; vertical-align: middle;">IPC⁴</td> <td style="text-align: center; vertical-align: middle;">F 16 L</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁸</div>			Classification System	Classification Symbols	IPC ⁴	F 16 L											
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width: 10%;">Category ⁹</th> <th style="width: 60%;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 30%;">Relevant to Claim No. ¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>FR, A, 2408784 (SMITKA-INVENT GmbH) 8 June 1979, see figure 4 cited in the application --</td> <td style="text-align: center; vertical-align: top;">1,8</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, A, 1650169 (WILHELM) 24 September 1970, see figures cited in the application --</td> <td style="text-align: center; vertical-align: top;">1,8</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>GB, A, 2132724 (ARNOLDT) 11 July 1984, see figures; page 4, lines 105-108 cited in the application --</td> <td style="text-align: center; vertical-align: top;">1,5</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, U, 8615108.8 (SCHAUER) 11 September 1986, see figures ----</td> <td style="text-align: center; vertical-align: top;">1,6,7</td> </tr> </tbody> </table>			Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	FR, A, 2408784 (SMITKA-INVENT GmbH) 8 June 1979, see figure 4 cited in the application --	1,8	A	DE, A, 1650169 (WILHELM) 24 September 1970, see figures cited in the application --	1,8	A	GB, A, 2132724 (ARNOLDT) 11 July 1984, see figures; page 4, lines 105-108 cited in the application --	1,5	A	DE, U, 8615108.8 (SCHAUER) 11 September 1986, see figures ----	1,6,7
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IV. CERTIFICATION <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 50%; padding: 5px;"> Date of the Actual Completion of the International Search <div style="text-align: center; margin-top: 10px;">17th July 1989</div> </td> <td style="width: 50%; padding: 5px;"> Date of Mailing of this International Search Report <div style="text-align: center; margin-top: 10px;">08 AUG 1989</div> </td> </tr> <tr> <td style="width: 50%; padding: 5px;"> International Searching Authority <div style="text-align: center; margin-top: 10px;">EUROPEAN PATENT OFFICE</div> </td> <td style="width: 50%; padding: 5px;"> Signature of Authorized Officer <div style="text-align: center; margin-top: 10px;">M. VAN MOL </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center; margin-top: 10px;">17th July 1989</div>	Date of Mailing of this International Search Report <div style="text-align: center; margin-top: 10px;">08 AUG 1989</div>	International Searching Authority <div style="text-align: center; margin-top: 10px;">EUROPEAN PATENT OFFICE</div>	Signature of Authorized Officer <div style="text-align: center; margin-top: 10px;">M. VAN MOL </div>											
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

BE 8900018

SA 28118

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/08/89. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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